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INFORMATION CIRCULAR

MARKETING STRATEGIC MICA

BY

LAWRENCE G. HOUK

I.C. 7219,
September 1942.

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

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By Lawrence G. Houk[2]

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INTRODUCTION

In modern warfare mica is truly indispensable. The coordination of combatant units necessitates maintenance of intricate communications equipment, in the construction of which high-grade sheet mica is essential. Scrap, ground, and the poorer qualities of block mica, which are less essential to the military program, are not considered in this paper. Furthermore, as the paper is designed primarily to assist mica miners, mica derivatives such as splittings and films are also excluded from discussion. The paper therefore relates solely to block mica of strategic quality.

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[1] The Bureau of Mines will welcone reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7219."

[2] Nonmetal Economics Division, Bureau of Mines.

Understanding of the many factors involved in marketing mica is definitely advantageous to mica miners. The nature and detrimental effects of impurities and imperfections, the standard classification by quality, the sizes in greatest demand, and other factors relating to consumers' needs are elements with which they should be acquainted so that they may properly prepare their mica and obtain the best possible prices for it. Proper trimming, sizing, and classifying add greatly to the value of block mica. Improper preparation, grading, and classification are the principal reasons for the prejudice against domestic mica, although some consumers report poorer splitting qualities and lower yield in otherwise excellent mica.

Heretofore our main source of strategic mica has been India, and to provide for any eventuality the United States Government has launched an extensive educational and financial-aid program to stimulate its production.

The writer wishes to acknowledge the assistance in the preparation of this paper from his colleagues in the Government, particularly Sidney A. Montague and Hubert O. DeBeck of the War Production Board.

GOVERNMENT PROGRAM

The United States Government is endeavoring to stimulate domestic production of strategic mica through various agencies, including the Geological Survey, War Production Board, Metals Reserve Corporation, and Bureau of Mines. The Geological Survey is making a series of studies of mica-producing areas in western North Carolina, New Hampshire, Georgia, South Dakota, and possibly New Mexico and Idaho; other areas may be added as the work progresses.

The recent streamlining of the Bureau of Mines to the present war program has included the establishment of Western, Central, and Eastern regional offices. Miners should address their inquiries to the office nearest them. These offices are: Eastern Region, College Park, Md.; Central Region, Rolla, Mo.; Western Region, Salt Lake City, Utah. Within each region are district representatives of the Bureau of Mines who will aid the miners with the many problems confronting them.

The War Production Board program will be financed by the Metals Reserve Corporation (a subsidiary of the Reconstruction Finance Corporation), which has designated the Colonial Mica Corporation as its agent. This corporation, which is nonprofit, will lease mining equipment, compressors, jackhammers, hoists, pumps, and supplies incident to their use at a 2-percent monthly rental (based upon cost), supervise development of mica properties, purchase strategic mica, and instruct miners in methods of trimming and grading. A 10-percent monthly rental based upon actual cost will be charged for expendable or miscellaneous tools. Domestic miners are assured markets for strategic mica at remunerative prices.

DOMESTIC CRITICAL OR STRATEGIC MICA[3/]

Strategic mica, according to the present definition contained in War Production Board Order M-101, is block and punch mica of better than heavy-stained quality, free of mineral inclusions (black or red spots, stains, or streaks), cracks, pinholes, cross-grains, reeves, and ribs and relatively free of clay staining. It must be hard, clear, reasonably flat, and capable of being evenly and easily split into laminations or sheets of uniform thickness over the entire area, yielding sheets of at least 1 by 1 inch in size. The heaviest demand at present is for 1-1/2 by 2 inches, 2 by 2 inches, and 2 by 3 inches. For most uses only muscovite is suitable. "Ruby" mica is not the only color type desired, as color is a minor criterion of value. All clear ruby mica generally has a power-factor loss low enough to be satisfactory for condenser use. Clear-green or dark micas have power factors varying from deposit to deposit, and although some are too high to make satisfactory condenser films, there are other less-exacting strategic uses for them. Both block and punch micas of strategic quality prepared according to the customary domestic standards are wanted, and there is no upper limit to the quantity of strategic mica needed. Punch can be utilized to best advantage for war purposes if miners will prepare it in accordance with the advice and assistance that will be made available through the Colonial Mica Corporation. The blocks should be sound, level, with edges not shattered or opened, and as free as possible from such defects as splits, knife cuts, creases, wavy laminae, or rock punctures.

Supplies of the grades and qualities required for nonmilitary purposes are expected to be adequate without special encouragement. Stimulation of production of these classes will not be a part of the program of the Mica Section of the War Production Board or of the Colonial Mica Corporation, because greater production of strategic mica will provide a larger proportion of nonstrategic block and a still larger proportion of scrap. The War Production Board is confining its efforts to deposits that will produce worthwhile quantities of critical mica.

PHYSICAL PROPERTIES

A peculiar combination of physical properties (perfect cleavage, heat and electrical resistance, flexibility, and elasticity) makes mica indispensable

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[3/] See glossary at end of report for definitions of terms used in this report.

for use in condensers, electrical generating and motive equipment, radio tubes, and certain airplane spark plugs. Transmitting, receiving, and trimmer condenser films, radio-tube bridges and supports, cigarette films and nose washers for airplane spark plugs, and magneto condenser films are the strategic forms of mica urgently needed for our war program.

Block mica must be free of structural imperfections (cross-grains, cracks, reeves, and ribs), and mineral inclusions (black or red spots, mineral stains, or streaks) to have strategic importance. It must be clear, flat, hard, and capable of being separated easily into thin films or sheets (1 mil or one-thousandth inch in thickness) of uniform thickness over the entire area without the development of an excessive proportion of partial films. Structural imperfections cause the mica to split unevenly, producing imperfect films, and inclusions reduce its electrical resistance and raise its power factor.

The structural imperfections that ruin otherwise good sheets of mica are designated by such descriptive terms as "ruled," "ribboned," "tangle-sheet," "herringbone," "A," "horsetail," "feather," "wedge," and "hair line." If inclusions are present, the mica may be described as (1) heavy-stained, (2) red-stained, (3) clay-stained, (4) light-dotted-stained, (5) black-spotted-stained, and (6) black-stained. Mica may be "rum," "ruby," "white," "smoky," green, light green, or silver-black in color.

Mica moderately stained with metallic oxides may be satisfactory for some dielectric uses, but mineral staining of any type renders it unfit for use in electrical condensers. The presence of numerous small air bubbles makes mica unsuitable for condenser use. Large air bells may be removed by careful splitting. Clay-staining occurs in mica only near the surface of deposits and renders it suitable only for scrap. The chemical analysis of a block muscovite mica affords no indication of its commercial value or possible use.

SPECIFICATIONS

The specifications of strategic mica are constantly being revised downward. Formerly, only slightly stained was acceptable for a specific purpose; now, fair-stained and even good-stained are being used. Some domestic mica, heavy-stained to stained according to the Indian standards, has definite strategic use because of its high degree of flexibility. It contains no mineral inclusions but a host of microscopic air bubbles. The War Production Board is endeavoring to substitute domestic mica and imported stained for good-stained Indian mica for military radio-tube supports and bridges as well as for other military requirements.

The specifications vary with use. For high-grade condenser work a low power factor is the determining element. In electrical-power generation dielectric strength and resistance to heat are important. For "cigarette" mica used in aviation spark plugs, flexibility is one of the deciding factors. "Cigarette" mica consists of films less than 1.2 mils in thickness that can be rolled around a 1/8-inch spindle without cracking or tearing and be free of pinholes and hair-line cracks. Nose washers on airplane spark plugs are made of high-heat-resistant phlogopite mica. Good condenser mica should have a power factor of 0.03 percent or less. A good dielectric mica should withstand at least 1,000 volts per mil of thickness of 4 to 6 mils when tested with 2-inch plate electrodes. Almost any mica will withstand 500° to 600° C. without appreciable change.

ECONOMIC CONSIDERATIONS

Some mica mines produce only scrap mica suitable for grinding, but others produce scrap and variable percentages of sheet and punch. The ratio of production of sheet to punch is important to any prospective producer, as is the relationship of sizes and qualities, because profitable operation may depend on marketing considerable quantities of low-value punch.

The yield of usable block mica varies considerably in different deposits but is always small. Generally, 2 to a maximum of 6 percent of the total rock moved is marketable as raw block mica. A considerable part of this is salable as punch and circle mica and a minor amount as rectangular block mica. Cobbing, rifting, and trimming eliminate 50 to 70 percent, and most of the resultant material may be the smallest size - 1-1/2 by 2 inches). Rarely more than 15 percent will be 3 by 4 inches and larger, and there is also the possibility of a large percentage of the sheets being heavy-stained or otherwise unsuitable for critical needs.

Mica mining, particularly if conducted by inexperienced operators, involves great financial risk owing to the irregularity of the borders of the pegmatites and the erratic distribution of the mica. These features dictate the size and shape of the openings and have an important bearing on the mining method to be employed. The minimum size of shipment depends upon the buyers' requirements and whether it is sold to a dealer or broker, a rifting shop, trimmer shed, or directly to a consumer. Ordinarily, mica miners have three choices in disposing of their mica: First and most common, they may sell their entire "mine-run" output to a trimmer shed or broker; second, they may sell the roughly graded qualities of sheet to the trimmer sheds or brokers; and third, they may prepare the mica for the consumer market. It must be recognized that the quality of mica and its degree of preparation and grading will vary from mine to mine and from time to time from the same mine; therefore, it is impossible to guarantee fixed prices for the output of any mine.

The demand for sheet mica is governed largely by activity in radio transmitting and receiving fields and in the electrical power-development field. Construction activity is a rough index of activity in ground mica. Since the Colonial Mica Corporation has come into existence demand, prices, and marketing procedure have changed. Present demand for the strategic qualities is very large, prices are stabilized at the highest level in our history, and the purchasing program of the Colonial Mica Corporation assures the miner a good price and ready market.

PREPARATION FOR MARKET

The proper preparation of sheet mica for sale requires judgment in eliminating minor structural imperfections and inclusions as well as knowledge and experience in trimming, splitting, cutting, grading, and classification. Grading and classification of mica are an attempt to arrive at a mean average in an endless series of variations in size and quality. The poorest quality in one classification approximately equals the best of the next inferior classification; likewise, the largest size in one grade nearly equals the smallest size of the next larger grade.

Processes of preparation include (1) cobbing or sorting, (2) rifting or sheeting, (3) trimming, (4) grading by size, and (5) classifying as to quality.

It is difficult to describe these operations to present a clear picture of the procedure.

Cobbing. - Crystals or "books" of mica as taken from the mine are known as "mine-run" and ordinarily rock adheres to them. Cobbing is the process of removing the dirt and rock from the crystals and segregating the defective mica (scrap) from the crystals that will yield good block (cobbed mica).

Rifting. - Preparation of mica by properly trained rifters is extremely important, as inexperienced workers will at best fail to recover the maximum value from the crude books and at worst can render a product virtually unusable for anything but scrap.

Rifting is splitting the cobbed mica into sheets, usually 10 to 125 mils thick. A single- or double-edged 3-inch-blade rifting knife is generally used in this operation, and its proper use involves considerable skill and experience.

The products of rifting are (1) untrimmed block of mixed sizes, (2) punch and washer stock, and (3) scrap.

Care should be exercised in rifting to avoid breaking or tearing laminations at each point where the knife is inserted in the rough book. Much potentially useful mica can be spoiled or reduced in value by careless or inexperienced rifting.

Trimming. - Trimming of rifted blocks to remove ragged and tangled edges may be accomplished by knife, shears, guillotine, or fingers.

In domestic practice ragged edges are broken from the edges of the rifted block mica with the fingers (thumb trim) or are roughly trimmed off with a knife so that very little usable mica is removed. The domestic practice is based upon sound experience, as the manufacturers can cut the largest possible pattern of specific quality from the rough-trimmed block and still have trimmings from which to produce smaller patterns of lower quality; but mica thus prepared is difficult to appraise properly, because the defective or unsound mica area is different in each piece.

Knife trimming produces a smaller quantity of uncut or unmanufactured mica and a larger percentage of scrap than thumb trim. Because of the greater proportion of waste in fabricating thumb-trimmed mica, as compared with knife-trimmed blocks, its value per pound is necessarily lower.

In general, block should be trimmed to produce a maximum of roughly rectangular or rounded shapes and a minimum of very irregular shapes. Punch seldom is split as thin as block and needs no knife trimming and very little thumb trimming. To facilitate further splitting, blocks should be knife-cut, with at least one edge beveled.

Because it is less closely trimmed, domestic mica does not compare favorably in appearance with imported mica. Importers demand closely trimmed block, as it would not be profitable to pay transportation and duty on factory scrap.

Care should be exercised in handling and packing high-quality block mica, as the surface is easily scratched and the edges readily damaged by rough handling and improper packing. It should be packed securely in wooden cases and compressed to prevent shifting during shipping. The interior of the case should be free from projecting nails and rough surfaces.

Grading. - Domestic mica is graded upon the basis of the largest usable rectangle of specific quality that can be cut from the block, although the edges may be heavy-stained or otherwise defective. It is important that the sound areas only of each block be considered in determining its grade size. The sound area of specific quality within the grade rectangle must be free of cracks, pinholes, cross-grained areas etc. Domestic grading as to size is as follows: The smallest circular size, designated as "small punch," yields disks at least 1 inch in diameter; next size is "punch," which must be large enough to yield a sound circle 1-1/2 inches in diameter if stained and 1-1/4 inches if clear. The next size is "circle," which yields disks 2 inches or more in diameter. Then follow the rectangular sizes or combinations equal in area to 1-1/2 by 2 inches, 2 by 2 inches, 2 by 3 inches, 3 by 3 inches, 3 by 4 inches, 3 by 5 inches, 4 by 6 inches, 6 by 8 inches, 8 by 10 inches, and larger, known as "sheet mica." Figure 1 shows these grade sizes graphically. Each size includes the designated dimensions and all larger sizes up to the next grade. A sheet 4-1/2 by 7 inches would be classed as 4 by 6 inches. Minimum size of electrical-quality sheet mica acceptable to the trade is 2 by 2 inches.

Use of simplified grading chart. - The three concentric circles in figure 1 show the minimum area of small punch, punch, and circle, respectively. Place the mica so that the circle of the sound area is centered at O, and observe the relation of the circles to this area. If it is larger than the smallest circle and smaller than the intermediate it is classed as "small punch;" if it is larger than the intermediate circle and smaller than the outer circle it is "punch," etc.

For rectangular or square blocks place the mica so that the lower right corner of the sound area is at O, the smaller dimension of the sound area extending along the vertical line, and the larger dimension along the horizontal line. The largest rectangle on the chart that is completely within the boundaries of the sound area indicates the grade size. Each grade size includes mica of the designated minimum dimensions and smaller than the next larger size. A block or sheet the usable area of which is 1-1/2 by 2-1/2 inches is classed as 1-1/2 by 2 inches. Sizes 8 by 8 inches and 8 by 10 inches and larger are not shown on this chart.

In many instances it will be well for the miner to prepare a grading chart suited to his specific needs. It must be remembered that the simplified chart shows only one dimension combination for each grade size. The minimum acceptable area for 2- by 2-inch sheets is 4 square inches and the maximum is 6 square inches. The smallest or minimum dimension in this grade is 1 inch. Thus, a strip of mica 1 inch wide may range from 4 inches to 6 inches in length. The following tabulation shows the combinations of dimensions that may be used to construct a 2- by 2-inch grading chart. The series of rectangles with a common point at O outline the smallest acceptable and largest areas economical in the 2- by 2-inch grade.

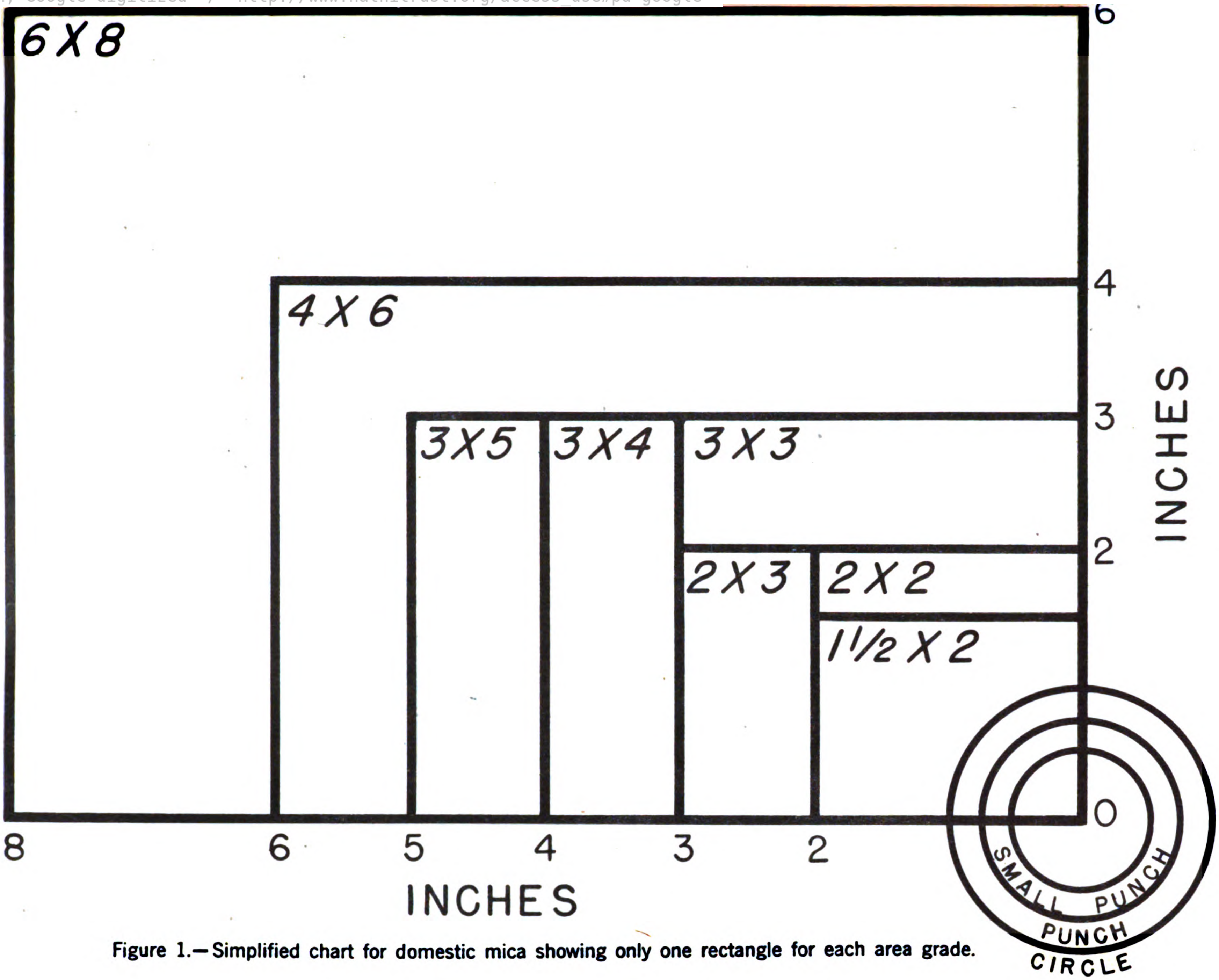

Figure 1.—Simplified chart for domestic mica showing only one rectangle for each area grade.

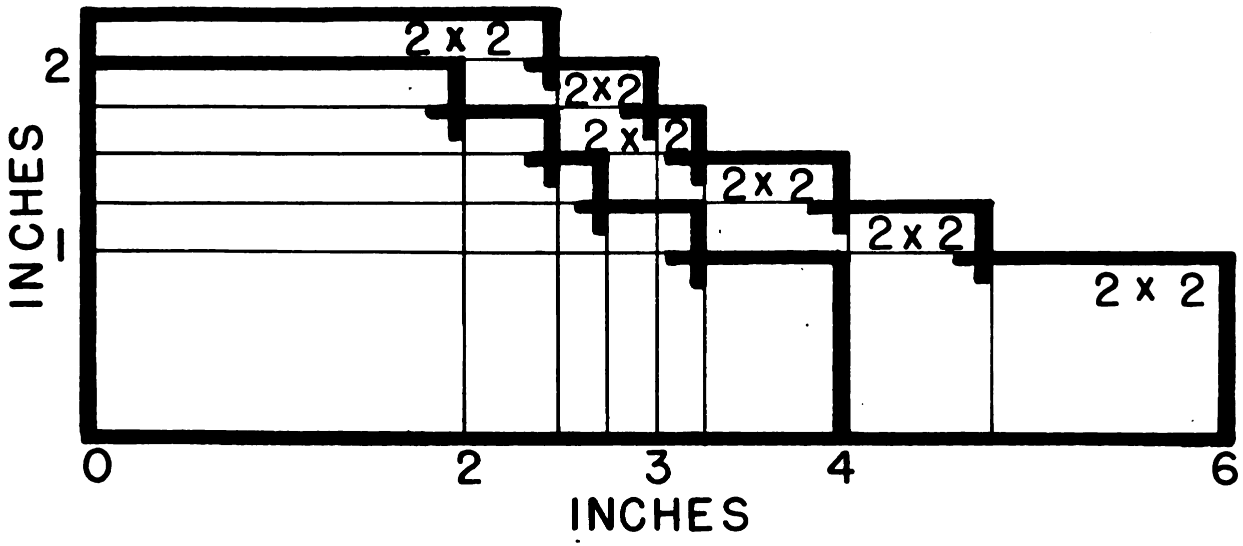

Figure 2.—Chart for grading 2- by 2-inch mica.

Smallest or minimum area (4 sq. in.), inches	Largest or maximum area (6 sq. in.), inches
1 by 4	1 by 6
1-1/4 by 3-1/4	1-1/4 by 4-3/4
1-1/2 by 2-3/4	1-1/2 by 4
1-3/4 by 2-1/2	1-3/4 by 3-1/4
2 by 2	2 by 3
	2-1/4 by 2-1/2

Actually, the dimensions in the column at the left outline the upper limit to the 1-1/2- by 2-inch grade and the lower limit of the 2- by 2-inch grade, whereas the column at the right is the upper limit of the 2- by 2-inch grade and the lower limit of the 2- by 3-inch grade. Figure 2 is constructed with the above dimensions and may be used to grade 2- by 2-inch sheets. In actual practice operators become very proficient and grade by eye without actually measuring each piece.

Domestic and Indian grading (by size), approximate comparison

Usual domestic grades	Area (in single rectangle), sq. in.			Standard Indian grades
	Minimum		Maximum	
Small punch	1	to	1-1/2	
Punch	1-1/2	to	2-1/2	No. 6
Circle	2-1/2	to	3	No. 5-1/2
1-1/2 by 2 inches	3	to	4	No. 5
2 by 2 inches	4	to	6	
2 by 3 inches	6	to	9	No. 4
3 by 3 inches	9	to	12	No. 3
3 by 4 inches	12	to	15	
3 by 5 inches	15	to	24	No. 2
4 by 6 inches	24	to	36	No. 1
	36	to	48	No. 1A
6 by 8 inches	48	to	64	Special
8 by 8 inches	64	to	80	Extra special
8 by 10 inches	80	to	96	Extra-extra special

Note. - In domestic preparation, only approximately 20 percent of domestic "punch" may be trimmed to Indian No. 6 grade; but approximately 75 percent of the larger domestic sizes may be recovered as the corresponding Indian grades. Size 6 is divided into small, regular, and large. Small punch is equivalent to the No. 6 small.

Colonial Mica Corporation will encourage the preparation of domestic mica of desirable qualities to full Indian standards by payment of a higher scale of prices. Miners interested in preparing their mica according to Indian standards should consult their nearest Colonial Mica Corporation field office to learn if their production is of a quality for which Indian trimming is desirable and to obtain a schedule of prices that would apply to their mica if so prepared and graded. Figure 3 is a chart for Indian grading of mica.

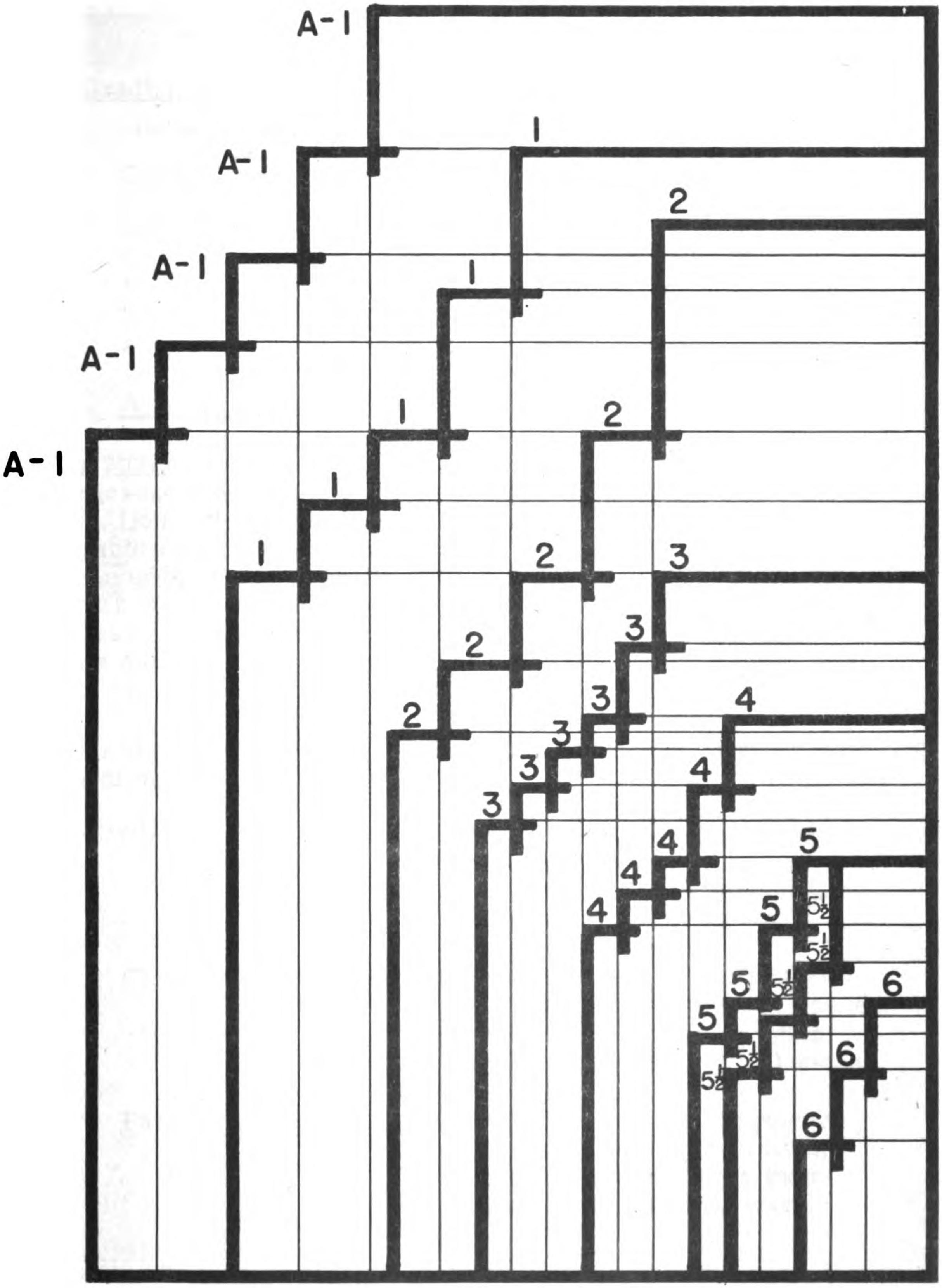

Figure 3.—Chart for grading mica to Indian standard sizes.

Grading according to Indian standards limiting dimensions

Grade	Width, inches		Length, inches	
	Minimum	Maximum	Minimum	Maximum
6	0.5	1	1	2
5-1/2	.75	1.5	1.5	3
5	1	1.7	1.7	3
4	1.5	2.5	2.5	4
3	2	3.2	3.2	5
2	2	3.7	3.7	7
1	3	4.9	4.9	8
A-1	4	6.0	6.0	9

Classifying. - Exact classification of mica for quality is extremely difficult because it depends somewhat upon individual interpretations of standards. Domestic mica is classified on the basis of the quality of the largest usable rectangle of sound area that can be cut from the block, although the edges may be heavily stained or otherwise defective, whereas by the Indian method the average quality of the entire piece is the basis of classification; many domestic miners who have not found it worthwhile to separate their block into several qualities will now profit by doing so because of higher prices being paid for clear qualities.

The American Society for Testing Materials has adopted the following standards of quality.

Clear	Free of all mineral and vegetable inclusions, stains, air inclusions, waves, or buckles. Hard transparent sheets.
Clear and slightly stained	Free of all mineral and vegetable inclusions, cracks, waves, and buckles but may contain slight stains and air inclusions.
Fair-stained	Free of mineral and vegetable inclusions and cracks, hard, and contains slight air inclusions, and is slightly wavy.

Good-stained	Free of mineral inclusions and cracks but contains air inclusions, some vegetable inclusions, and may be somewhat wavy.
Stained	Free of mineral inclusions and cracks but may contain considerable clay and vegetable stains and may be more wavy and softer than the better qualities.
Black-stained or spotted	Same as stained but contains mineral inclusions.

Black-stained is sometimes separated into four qualities or classes. They are, in descending order of quality, showing increase in degree and distribution of staining: (1) Heavy-stained, (2) light-dotted, (3) black-spotted, and (4) black-stained. Black-stained contains varying proportions of iron or other metallic oxide in stains, streaks, or spots.

Approximate comparison of domestic and Indian classification

Usual domestic qualities	Standard Indian qualities
Strategic	
	Clear.
	Clear and slightly stained.
	Slightly stained.
	Fair-stained.
No. 1 Clear	Good-stained.
No. 2 Clear	Stained.
Nonstrategic	
No. 1 Electric	Heavy-stained.
No. 2 Electric	(Light-dotted. (Black-spotted.
No. 3 Electric	Black-stained.

Best-quality heavy-stained is being employed in strategic uses, and attempts are being made to utilize this type to a greater extent. The domestic clear micas, as commonly prepared, represent a mixture of qualities according to the Indian standards. Thus, the "No. 1 Clear" domestic is ordinarily equivalent to a mixture of Indian qualities averaging approximately "good-stained" to "fair-stained;" "No. 2 Clear" is equivalent to "Stained A and B Brazilian."

Prices

Raw mica is marketed in a confusing variety of sizes (grades) and classes (qualities) ranging in value from a fraction of a cent a pound for small, stained, imperfect flakes or scrap to over $20 a pound for exceptionally large, flat, clear crystal sheets. Not only does marketable mica vary greatly in size, from small punch to 8 by 10 inches and larger, but for each grade there are at least nine different qualities, ranging from clear to black-stained. Block mica is marketed as (1) thumb-trimmed block, (2) part-trimmed block, and (3) knife- or sickle-trimmed block.

The pound (avoirdupois) is the unit upon which the price of sheet mica is based, although finished condenser films, radio-tube supports, and certain other items usually are sold by the thousand pieces. Though value is based in general upon size and quality, prices of comparable products may vary considerably, as they are usually determined by individual bargaining rather than by fixed quotations. The abundance or shortage of a particular size or quality has a decided influence on the price.

The Colonial Mica Corporation will pay the following prices for domestic mica until June 30, 1943, after which prices will depend on war conditions. These apply to No. 1 quality thumb-trimmed or rough-trimmed mica (North Carolina method of preparation).

Grade, inches	Price per pound
Punch mica	$0.22
1-1/2 by 2	1.10
2 by 2	1.75
2 by 3	2.75
3 by 3	3.50
3 by 4	4.25
3 by 5	5.00
4 by 6	6.25
6 by 8	8.00

The above prices are base prices only. Mica of a quality poorer than No. 1 will take a discount from this scale, the exact amount of which will depend on the judgment of Colonial Mica Corporation buyers. Substandard preparation or smaller-than-customary grading will require a further discount. Bonuses will be paid for better-than-average preparation or liberal grading to the degree that they approach Indian standards.

These prices are to be paid by the Colonial Mica Corporation for mica at the rifting and splitting shops of the producers. This applies to mines in the North Carolina, Georgia, and New Hampshire districts. It may be necessary, where mines are in very remote districts, to make these prices apply to deliveries at the nearest railroad point or to make deductions for haulage from mine to railroad.

When it is necessary for Colonial Mica Corporation to buy nonstrategic qualities, it is limited in the prices it can pay by the Office of Price Administration "General Maximum Price Regulation," which establishes the highest price at which the same or similar mica was sold in March 1942 as the legal ceiling. There is a separate ceiling for each mine or each different quality of nonstrategic mica. According to the General Price Regulation:

> In those cases in which the seller did not deal in the same or similar commodities or services during March 1942: The highest price charged during such month by the most closely competitive seller of the same class - (1) For the same commodity or service; or (2) If no charge was made for the same commodity or service, for the similar commodity or service most nearly like it.

Buyer and seller are equally guilty if transactions take place at above legal ceilings. Care must be exercised on both sides to avoid violation of this important regulation.

REGULATION AND CONTROL OF FEDERAL WAR AGENCIES

The following regulations and controls of uses and prices were made effective as of June 24, 1942:

WPB Conservation Order M-101 as Amended:

Block mica (including its derivatives) of qualities better than heavy-stained may be used only on military and a few other Governmental contracts, and then only if so required by the specifications of the contracts concerned. Only the minimum standard sizes (grades) and lowest standard qualities required by the specifications of the contracts concerned may be so used. All other uses of strategic qualities (better than heavy-stained) of block mica are eliminated except by appeal.

On and after July 1, 1942, ALL uses (including military contracts) of strategic qualities of mica must be authorized by application addressed to the Director General for Operations, WPB, Washington, D. C.

OPA Price Regulation and Control:

Block mica (including its derivatives) of strategic qualities (better than heavy-stained) are exempt from existing price regulations or price "freezing." The prices of all other types of raw mica (including scrap mica) are "frozen" at the scale of maximum prices paid for the individual grades (sizes) and/or qualities during March 1942 by the General Maximum Price Regulation.

WPB Conservation Order M-63 as amended:

This order restricts the importation of specified strategic materials, including all kinds of mica except scrap and ground mica. Mica may be imported only with authorization of the Director General for Operations. At present, applications for imports of mica from all countries except India and Brazil are being favorably considered. In those two countries an agency of this Government is now the sole buyer of mica.

PRIORITIES

The Mining Branch of the War Production Board suggests use of the accompanying form to obtain a serial number, which is necessary before priority ratings will be granted for purchase of new or operating equipment. This information should be forwarded to the State Coordinator of Mines in your State. Names and addresses of such coordinators are listed below:

No.	State	STATE COORDINATORS OF MINES
22	Alabama	E. J. McCrossin, Phoenix Bldg., Birmingham (Dept. Ind. Relations).
48	Arizona	C. M. Martin, Civilian Def. Priorities Div., 1821 E. Jackson St., Phoenix.
25	Arkansas	Richard J. Anderson, State Geologist, 447 State Capitol, Little Rock.
31	California	Kenneth I. Fulton, Emerg. Coord. of Mines, State Div. of Mines, Ferry Building, San Francisco.
38	Colorado	Robert S. Palmer, 204 State Office Building, Denver.
5	Connecticut	George L. Burke, Comm. Dept. of Public Mines, State Office Bldg., Hartford.
1	Delaware	Desmond Lyons, State Tax Comm., 843 King St., Wilmington.
27	Florida	Herman F. Gunter, State Geologist, Box 631, Tallahassee.

No.	State	STATE COORDINATORS OF MINES (Cont'd)
4	Georgia	Capt. Garland Peyton, Dir. Georgia Div. of Mines, Mining & Geology, 425 State Capitol, Atlanta.
43	Idaho	C. E. Arney, State Coord. of Civ. Def., 351 Capitol Bldg., Boise.
21	Illinois	Robert M. Medill, 11 So. LaSalle St., Roanoke Bldg., Chicago.
19	Indiana	Clarence A. Jackson, Civ. Def. Direc., Board of Trade Bldg., Indianapolis.
29	Iowa	George Duckworth, Sec. State Mining Dept., Des Moines.
34	Kansas	A. V. Lundgren, Labor Commissioner, 801 Harrison St., Topeka.
15	Kentucky	G. Moss Patterson, Dir. Dept. of Mines & Min., Box 680, Lexington.
18	Louisiana	Joseph L. McHugh, 126 Civil Courts Bldg., New Orleans.
23	Maine	Ralph A. Ranger, Industrial Engineer, 142 High St., Portland.
7	Maryland	John J. Rutledge, Maryland Bureau of Mines, State Office Bldg., Annapolis.
6	Massachusetts	Dr. Warren J. Mead, Prof. of Geology, Massachusetts Inst. of Technology, Cambridge.
26	Michigan	Benjamin F. Sparks, Emerg. Coord. of Mines, Box 355, Escanaba.
32	Minnesota	Ray Nolan, 14 State Office Bldg., St. Paul.
20	Mississippi	C. Fred Morgan, Emerg. Coord. of Mines, State Capitol, Jackson.
24	Missouri	John A. Skinner, Mine Inspector, Bu. of Mines, Jefferson City.
42	Montana	Tom D.Caverly, Defense Council Coordinator, Helena.
37	Nebraska	Blain Yoder, State Purchasing Agent, State Capitol, Lincoln.
36	Nevada	Matt Murphy, State Mine Inspector, Carson City.
9	New Hampshire	Edward Ellingwood, State House Annex, Concord.
3	New Jersey	Meredity E. Johnson, Room 417, State House Annex, Trenton.
47	New Mexico	John M. Kelley, State Geologist and Chairman of Oil Conservation, Box 871, Santa Fe.
11	New York	Miss Frieda S. Miller, Comm. of Labor, 80 Centre St., New York City.
12	North Carolina	Dr. J. L. Stuckey, State Geologist, Raleigh.
39	North Dakota	W. T. Kraft, 315 Broadway, Bismarck.
46	Oklahoma	R. R. Owens, State Budget Officer, Oklahoma City.
33	Oregon	Earl K. Nixon, Coord. of Mines, State Dept. of Geology & Mineral Ind., Portland.

No.	State	STATE COORDINATORS OF MINES (Cont'd)
17	Ohio	George A. Strain, Dept. of Industrial Relations, Columbus.
2	Pennsylvania	Richard Maize, Dept. of Mines, Harrisburg.
13	Rhode Island	Frank A. Sullivan, P. O. Box 502, Westerly.
8	South Carolina	B. Roy Jones, Comm. of Agric., Wade Hampton Office Bldg., Columbia.
40	South Dakota	Harry H. Stewart, Supt. of Mines, Deadwood.
16	Tennessee	S. E. Bryant, Commissioner, Tennessee Dept. of Labor, Nashville.
28	Texas	Prof. John D. Graham, College of Mines, El Paso.
45	Utah	Wendell Grover, Ind. Comm., State Capitol Bldg., Salt Lake City.
14	Vermont	Wm. L. McKee, Unemployment Compensation Comm., Montpelier.
10	Virginia	John Hopkins Hall, Commissioner of Labor, Richmond.
42	Washington	Robert H. Marlin, State Dir. Labor & Indus., Olympia.
35	West Virginia	N. P. Rhinehart, State Capitol, State Dept. of Mines, Charleston.
30	Wisconsin	A. H. Findeisen, Inc. Commissioner, Madison.
44	Wyoming	J. M. Sampson, Bu. of Mines, Rock Springs.
50	Alaska	Benjamin D. Stewart, Territorial Commissioner of Mines, Juneau.
53	Puerto Rico	Martin Lopez-Sanabria, Dept. of Interior, Bu. of Mines, San Juan.

In regard to future issuance of serial-number certificates to nonmetallic operators, it is suggested that the following data be submitted so that proper consideration can be given to the issuance of such a serial number by the Mining Branch of the War Production Board in conformity with paragraph B-3 of order P-56, amended:

1. Name of company and main office address.
2. Name of mine, pit, quarry, or plant.
3. P. O. address of above.
4. Materials produced.
5. Daily production, expressed in tonnage:
    (a) Mine ____________
    (b) Plant ____________
6. Number of men employed:
    (a) In mine, pit, or quarry __________
    (b) In plant for processing __________

7. List of defense contracts on which your material is being supplied, and percentage of the current output consigned to defense orders:

(a)__________________________________ ______________%

(b)__________________________________ ______________%

(c)__________________________________ ______________%

(d)__________________________________ ______________%

(e)__________________________________ ______________%

The Colonial Mica Corporation has a main office at 92 Liberty St., New York City and has field offices at 542 McDowell St., Asheville, N. C., with B. C. Burgess as district manager, and at 22 Ash St., Newport, N. H., with Roscoe J. Whitney as district manager.

LISTS OF BUYERS AND GRINDERS

Private Buyers

Illinois:

American Mica Products Co., 313 W. Chestnut St., Chicago (1) (2).
Perfection Mica Co., 2400 West Madison St., Chicago (1) (2).

Massachusetts:

Huse-Liberty Mica Co., 171 Camden St., Boston (1) (2).
The Macallen Co., 61 Macallen St., Boston (2).

New Hampshire:

General Electric Co., Bristol (1) (2).
New Hampshire Mica & Mining Co., Keene (1) (2).
E. E. Smith, Canaan (1) (2).

See footnotes at end of list.

New York:

Brooklyn:

Ford Radio & Mica Corporation, 832 4th Ave. (1) (2).
Industrial Mica Corporation 945-64th St. (1) (2).
Reliance Mica Co., 342 39th St. (2).

New York City:

American Mica Works, 49 West St. (2).
William Brand & Co., 276 4th Ave. (1) (2).
Otto Gerdau Co., 533 Canal St. (1) (2).
K & K Mica Insulation Co., Inc., 775 Henderson Ave., West Brighton, Staton Island (1) (2).
Minerals & Insulation Corporation, 135 Price St. (2).
Eugene Munsell & Co., 200 Varick St. (1) (2).
A. O. Schoonmaker Insulation Co., Inc., 635 Greenwich St. (1) (2).
Heyman Co., Inc. 157 Chambers St. (1) (2).
Varlacoid Chemical Co., 116 Broad St. (1) (2).

North Carolina:

Asheville Mica Co., Biltmore (1) (2).
Spruce Pine Mica, Inc., Spruce Pine (1) (2).
Tar Heel Mica Co., Plum Tree (1) (2).

South Dakota:

Gladys Wells, Custer (1) (2).

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(1) Punch and circle.
(2) Uncut block.

All scrap mica is included in "nonstrategic," and it is not expected that the Colonial Mica Corporation will purchase it. Any miner who has difficulty in disposing of his scrap may solicit the help of Colonial Mica Corporation to find a market or correspond with one of the following firms:

Mica Grinders

Asheville Mica Co., Biltmore, N. Car.	Dry.
Carolina China Clay Co., Penland, N. Car	Do.
Concord Mica Co., 159-69 E. Main St., Concord, N. H.	Wet.
English Mica Co., Spruce Pine, N. Car.	Wet, dry and micronized.
Franklin Mineral Products Co., Franklin, N. Car.	Wet.
Harris Clay Co., Spruce Pine, N. Car.	Dry.
Mica Pulp Co., Jamestown Star Route, Boulder, Colo.	Do.
Newdale Mica Co., Erwin, Tenn.	Dry and wet.
Richmond Mica Corporation, 323 South 9th St., Richmond, Va.	Wet.
Sierra Minerals, Inc., 2455 E. 57th St., Los Angeles, Calif.	Dry.
Southern Mica, Johnson City, Tenn.	Do.
Thompson-Weinman, Cartersville, Ga.	Do.
U. S. Mica Mfg. Co., 1525 Circle Ave., Forest Park, Ill.	Do.
U. S. Mica Mfg. Co., E. Rutherford, N. J.	Do.
Vance, D. T., Plumtree, N. Car.	Wet.
Vance-Barrett, Plumtree, N. Car.	Do.
Victor Mica Co., Spruce Pine, N. Car.	Dry.
Western Nonmetallics, Inc., Pueblo, Colo.	Do.
Green Mountain Mica Corporation, Gassetts, Vt.	Wet
Kennedy Minerals Co., Inc., 2550 E. Olympic Blvd., Los Angeles, Calif.	Dry.
Mineral Mining Corporation, Kershaw, S. Car.	Wet.

Waste or scrap mica suitable for grinding may be (1) "mine-scrap" waste from mining, cobbing, and rifting sheet mica, (2) factory scrap from punching and trimming sheet, (3) byproduct mica from clay washing, kyanite, etc., (4) mica mined exclusively for grinding and not suitable for sheet, or (5) mica schists.

BUREAU PUBLICATIONS ON MICA

Information Circular 6612, Mica-Mining Methods, Costs, and Recoveries at No. 10 and No. 21 Mines of Spruce Pine Mica Co., Spruce Pine, N. C., by H. M. Urban, 1932, 16 pp.

> This paper is designed to disseminate technical information regarding the methods used. The cost tabulations represent operating expenditures only and not total costs. It is recognized that publication of total costs might cause embarrassment to some individual producers as well as to the industry as a whole. On the other hand, operating costs are essential to the technical discussion and study of methods employed.

Inasmuch as this is the first circular concerning mica mining, some information is included with reference to the occurrence of block mica and the history of mica mining in North Carolina, together with a few notes on the physical properties and uses of the mineral and methods of processing it for use in various industries. The two mining operations described are similar, but the difference in character and value of these products affords instructive comparisons.

Information Circular 6822, Mica, by F. W. Horton, revised 1941, 55 pp..

This paper covers the salient features of the occurrence and mining of sheet mica in the United States and the preparation of mica for market; presents the results of a study of the physical properties of domestic and foreign micas, which the author hopes may be of interest to every mica user, as it definitely answers many questions as to the suitability of various micas for particular purposes; and discusses mica-trade conditions and the future outlook for the domestic mica industry.

Minerals Yearbook Chapters.

The Economics and Statistics Service of the Bureau of Mines each year prepares a resume of the pertinent statistics of the mica industry. However, because of war restrictions, figures for 1941 have not been released.

GLOSSARY OF TERMS

Block mica	Random thickness 1/8 inch to less than 1/100 inch (125 to 10 mils), which contains a usable area of 1-1/2 by 2 inches minimum. The general term "block mica" is the correct designation for the more commonly used domestic form, "sheet mica" in Southeastern States, and "plate mica" in the New England and Western States.
Circle	Roughly better than 2 inches in diameter, usable area.
Classification	Process of qualifying or segregating block mica as to quality. The domestic and Indian qualities are shown on page 12.

GLOSSARY OF TERMS (Cont'd)

Heavy-stained	May contain minor cracks, clay, and vegetable stains, but should be relatively free of mineral inclusions.
Red-stained	Similar to the above, with red inclusions.
Clay-stained	Inclusions of clay or mud within the laminae.
Light-dotted-stained	May contain mineral inclusions in very small dots in segregated areas.
Black-spotted-stained	May contain mineral inclusions in splotches; a greater area may be affected than in light-dotted, and size of the inclusions may be greater.
Black-stained	Contains black streaks, stains, and spots; virtually entire area of sheet is affected.
Clear	Transparent, without discolorations, capable of being seen through; should present a mirrorlike surface in reflected light, uniform throughout.
Color	Clear muscovite in thin films is almost colorless. Films about 50 mils are best for judging color. "Ruby" is ruby red. Other colors need no explanation, though "smoky" commonly indicates presence of numerous microscopic air bubbles or mineral inclusions.
Dielectric	An insulating substance capable of supporting electrical stress.
Electrical mica	Heavy-stained, light-dotted, black-stained, heavy black-stained qualities.
Flat	Having a plane surface containing no ridges, waves, or ripples.
Grading	Process of sizing or segregating into groups mica of roughly the same size.
Hard	Hardness usually ranges between 2.1 and 2.5 on Mohs' scale; used here to mean solid, unweathered, and elastic.

GLOSSARY OF TERMS (Cont'd)

Knife- or sickle-trimmed block	All imperfections removed may be rectangular, circular, or irregular in shape. One side should be beveled to facilitate further splitting. In circular sickle trim no large reentrant angles ("rabbit ears") should be present.
Mica	Group of complex silicate minerals of variable chemical composition; common characteristic of all is their highly developed cleavage. Muscovite. phlogopite, and biotite are the commonest varieties. This paper is concerned principally with muscovite.
Part-trimmed block	May contain minor imperfections, cracks, or punctures near the edges.
Partial films	Films of smaller area than the block from which they are split .
Power factor	Measure of loss of electrical energy in a condenser or capacitor. Condensers store electrical energy for an instant, then return it to the circuit, the loss of energy being the measure of its power factor. Power factors should be 0.02 to 0.04 percent for condensers.
Punch	Mica having usable area less than 1-1/2 by 2 inches. A collective term including small punch, washer, disk, and punch.
Scrap mica	Mica so irregular in size and quality that it is suitable for grinding only. It may be (1) run-of-mine scrap, (2) factory scrap, (3) punch scrap.
Sheet	Cut or manufactured mica.
Structural imperfections	Mechanical defects caused by pressure during or subsequent to formation of crystals or intergrowths of crystals.
A	A series of rulings or striations intersecting at about 60°.
Cracks	Irregular separations within a crystal that may arise from blasting, rough handling, or natural causes.

GLOSSARY OF TERMS (Cont'd)

Cross grains	Breaks or tears in splitting that produce only partial films. Sometimes an intergrowth of two crystals.
Hairlines	Irregular imperfections that are not noticeable until split into films; they cause tearing and production of partial films.
Herringbone	Numerous rulings that intersect to form a series of V's, the legs making angles of 120° and joining at the apex to produce herringbone, horsetail, or feather structure.
Reeves	North Carolina's term for cross-graine
Ribboned	Mica that splits into ribbons or long narrow strips because of parallel rulings.
Ribs	Waves or ridges in the crystal sheets.
Ruled....................................	Containing planes of separation in addition to and at various angles to the cleavage plane.
Tangle sheet	Sheets that split well in places but tear in others, producing a large percentage of partial films. Sometimes the term is applied to intergrowth of sheets.
Wedge	Mica that, when split, yields sheets thicker on one end than on the other.
Thumb-trimmed block	Major imperfections removed; outside edges may contain mineral-stained areas, cracks, reeves, and imperfections.